Science Council of British Columbia

Ninth Annual Report

1986-87

Secretariat on Science,
Research and Development

88-00183/

Table of Contents

Page	3	Letter of Transmittal
Page	4	Members and Staff
Page	7	From the Chairman
Page	9	Year in Review
Page	14	A.G.A.R. Research Grants
Page	22	G.R.E.A.T. Scholarships
Page	26	I.P.D.F. Fellowships
Page	27	Financial Statements

June 30, 1987

The Honourable Stanley B. Hagen,
Minister of Advanced Education and Job Training,
Province of British Columbia,
Parliament Buildings,
Victoria, B.C.
V8V 1X4

Dear Mr. Hagen:

I have the honour to present to you the Ninth Annual Report of the Science Council of British Columbia, and of the Secretariat on Science, Research and Development, for the year ending March 31, 1987.

Respectfully submitted

Denis Connor,
Chairman,
Science Council of British Columbia

Chairman

Dr. D.J. Connor

Executive Director

Dr. J.T. Sample

Dr. W.M. Armstrong

Mr. G.S. Balcom

Dr. D.H. Copp

Dr. J.M. Dewey

Dr. J.H. Dirks

Mr. K.A. French

Dr. D.A. George

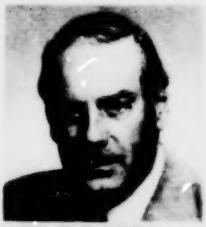
Mr. B. Hodges

Dr. T.E. Howard

Dr. P.A. Larkin

Dr. G.A. May

Dr. J.A. McEwen



Mr. D.F. Miller

Dr. G.W. Poling

Dr. I.H. Warren

Members of The Science Council of British Columbia

Member	Date of First Appointment	Current Term Expires
Dr. D.J. Connor Vice President, Corporate Development MacDonald Dettwiler & Associates Vancouver	February 20, 1985 (Chairman from January 15, 1986)	February 20, 1987
Dr. W.M. Armstrong Retired, Vancouver	January 29, 1982	Honorary Member
Mr. G.S. Balcom President Harmattan International Consulting Limited Vancouver	March 24, 1983	July 18, 1987
Dr. D.H. Copp Department of Physiology, University of British Columbia	January 30, 1981	March 14, 1987
Dr. J.M. Dewey Professor, Department of Physics University of Victoria	February 13, 1985	February 13, 1987
Dr. J.H. Dirks Head, Department of Medicine University of British Columbia	December 5, 1985	December 5, 1987
Mr. K.A. French President, Forintek Canada Corporation, Vancouver	February 23, 1984	February 23, 1986
Dr. D.A. George Dean of Applied Sciences Simon Fraser University	July 28, 1983	July 18, 1987
Mr. B. Hodges President Windsor Machine Company Ltd. Burnaby	June 13, 1984	June 13, 1986
Dr T.E. Howard President B.C. Research Vancouver	July 26, 1984	July 26, 1986

Members *cont.....*

	Date of First Appointment	Current Term Expires
Dr. P.A. Larkin Vice-President Research University of British Columbia	March 14, 1985	March 14, 1987
Dr. J.A. McEwen Director Biomedical Engineering Department Vancouver General Hospital	September 18, 1986	September 18, 1988
Dr. G.A. May President, George A. May & Associates Ltd., Sooke	July 28, 1983	July 18, 1987
Mr. D.F. Miller Corporate Director, Vancouver	December 14, 1983	December 14, 1985
Dr. G.W. Poling Professor Department of Mining and Mineral Process Engineering, University of British Columbia	February 23, 1984	February 23, 1986
Dr. I.H. Warren Technical Consultant Research & Development Department Chemetics International Richmond	June 13, 1984	June 13, 1986

Research Secretariat of B.C. Staff (April 1986-March 1987)

Dr. J.T. Sample	Executive Director
Dr. M.A. Cairns	Associate Director
Miss T.L. Bowyer	Receptionist/Secretary
Mr. C.N. Brown	Awards Officer (T.E.S.T.), from February, 1987
Mrs. M.G. Eickhoff	Secretary (B.C.HCRF)
Mrs. P.A. McKeever	Secretary
Mr. D.G. McPherson	Accountant (part-time consultant)
Mr. D.A. Rodger	Information Officer (part-time consultant)
Mr. R.W. Warner	Awards Officer (Science Council)
Dr. D.B. Whitney	Awards Officer (B.C.HCRF)
Miss K.C. Woudstra	Receptionist/Secretary (T.E.S.T.), from March, 1987

From the Chairman:

During the past year, Science Council has emphasized communications and planning so as to build on the success documented in the Walden report of the previous year. These activities will form the basis for a number of new initiatives in the coming year all directed at identifying and exploiting opportunities for enhancing the provincial economy through the application of science and technology. Our existing programs were continued at their previous levels due to government funding restraints even though a Lost Opportunities Study identified a 16 to 1 composite payback on nearly $1 million of unfunded grant applications for AGAR seed money.

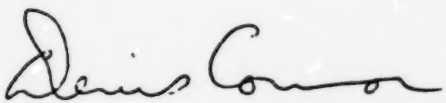
Meanwhile the Science and Technology based sectors of the provincial economy, such as electronics, aquaculture and bio-engineering, continue to grow and prosper. As an example, in the electronics sector, companies like MacDonald Dettwiler, whose FIRE 9000 received early Science Council support, and Nexus Engineering, whose president received a Council post-doctoral fellowship during the company start-up, are now adding hundreds of jobs a year to the provincial economy. These and other successes illustrate how the Council, through its 15 members and the 60 members of its sectoral subcommittees, can identify opportunities where small amounts of provincial money can seed activities that have substantial and lasting economic benefit.

In order to make people in the government, business, universities and in the community at large aware of the economic benefits being realized through the application of science and technology, a communications program has been initiated. The Chairman has given a number of talks to industry associations, including the Electronic Manufacturers Association of B.C., the Mining Association, the Rotarians, the Thompson-Nicola Manufacturers Association, and the Association of Regional Development Officers. Visits were made to the University of B.C. and the University of Victoria. A presentation was made to the Cabinet Committee on Economic Development and numerous meetings were held with government consultants. Finally, a new video show documenting Council activities was widely distributed. These activities seem to be bearing fruit, one notable example being that the Chairman was part of the B.C. delegation at the federal and provincial Science Ministers' conference in March, 1987.

From the Chairman *cont.....*

However, much more effort is needed to establish effective two-way communication between all the groups who are, or should be, involved in building the science and technology basis for the future B.C. economy. This economy will always have a strong basis in the resource sector. However, science and technology will allow that sector to remain vitally competitive, to build a substantial value added sector, and to be the basis for equipment supply sector. The present wild harvest based fishing industry will give way to a knowledge intensive aquaculture industry that exploits the sheltered, nutrient-rich waters of the B.C. coast. Finally, the congenial environment and geography, the good education institutions, the stable social infrastructure and the export-oriented business climate will be the basis for growing electronics, software and bio-engineering industries.

In order to define its role in building this new science and technology based economy, the Council has initiated a strategic planning process which will be completed by September, 1987. It is already apparent that a key element in this role will involve use of the "people network" available through our subcommittees. We will foster dialogue within and across sectors and institutions so as to build a consensus on the major opportunities for economic enhancement through the application of science and technology. As part of fostering such dialogue, background studies and planning are well advanced for a May, 1987 Advanced Forest Technology Symposium, to bring together people from the forest industry and the electronics and machinery supply industries. This symposium is a joint activity of the Science Council, the Canadian Advanced Technology Association and the Ministry of State for Science and Technology. Similar symposia will be carried out relating to other sectors of the economy.



Denis Connor

The Year in Review

A Year of Change and Promise

The Science Council spent much of the year strengthening its lines of communication with the provincial government. The principal objective of this activity was to show that the provincial funds the Council administers have had a very positive effect on the growth and diversification of the economy. To this end, on December 18, 1986, the chairman, Dr. Denis Connor, appeared before the Cabinet Committee on Economic Development, chaired by the Honourable Grace McCarthy, Minister of Economic Development.

In his presentation, Dr. Connor used information gathered by independent consultant Dr. Craig Walden. That survey of the 207 applied scientific research projects assisted by the Council between 1980 and 1985, provided clear evidence that, for every dollar of Science Council money invested, between four and five will have been returned to the provincial economy by the end of 1987, and that, during the expected lifetime of the technologies involved, the return will approach twenty-to-one!

An in-depth summary of the Walden Report, together with specific examples of projects helped through the Science Council's AGAR (Assistance Grants for Applied Research) program, was published and circulated widely in the summer of 1986. Specific details were provided in last year's annual report.

The year was also one of considerable change with respect to the Council's formal relationship with the provincial government. Dr. Pat McGeer, who was instrumental in the Council's creation in 1978, left the government following the October provincial election. His Ministry of International Trade, Science and Investment, which had come into existence in early 1986, disappeared. Accordingly, the science component, including the Science Council, moved to the Ministry of Economic Development. Even that new home was temporary shelter. As the fiscal year drew to a close, responsibility for science and technology was transferred to the new Ministry of Advanced Education and Job Training under the Honourable Stanley Hagen.

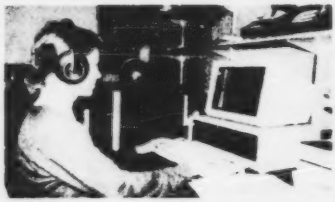
Assistance Grants for Applied Research

The AGAR program is the Science Council's flagship. AGAR grants are intended to stimulate the application of scientific research by the universities, not-for-profit research institutes and by private companies and individuals. The Council hopes that, by providing this "seed money" at an early stage in the development process, the provincial economy will be broadened quickly, and that the benefits of that investment will pay off in new or improved products, systems and processes and, of course, new jobs.

Technician Ron Smith assists projects leader Derek Albon on an AGAR-assisted project at Abbotsford's Clayburn Industries.

In the two AGAR competitions held in 1986-87 (the 14th and 15th since the program began in 1980), a total of $2,920,878 was shared among 68 projects. Applications were reviewed by sub-committees in ten sectoral areas: Agriculture and Food; Aquatic Resources (Fisheries and Aquaculture); Biotechnology; Computers and Computing; Electronics and Communications; Energy; Forest and Forest Products; Manufacturing and Machinery; Mining, Minerals and Metals; and Transportation.

Graduate Research, Engineering and Technology Scholarships



Suzanne Urbanczyk, a native of Terrace, B.C. is one of the University of Victoria's GREAT scholarship winners.

GREAT scholarships are designed to encourage students, working on their master's degrees and doctorates in science and engineering, to carry out their thesis research in cooperation with an off-campus company, agency or research institute. The objective is to enable the students to become familiar with the challenges of conducting research in the private sector, and to encourage closer cooperation between the private sector and the universities.

Thirty-nine of British Columbia's future scientists and engineers were awarded GREAT scholarships in 1986-87. This year, the value of the scholarships was increased by $1,000 to $13,000. The students receiving them are in postgraduate studies at Simon Fraser University, the University of British Columbia and the University of Victoria.

Industrial Postdoctoral Fellowships

Industrial Postdoctoral Fellowship winner Dr. Bruce Sharpe is an imaging technology specialist at MacDonald Dettwiler and Associates in Richmond.

These fellowships are intended to make it easier for men and women, who have recently received Ph.D.'s in science and engineering, to find employment in the private sector of the British Columbia economy. The Science Council pays $25,000 per year, for a maximum of two years, to qualifying companies and applicants.

Seven new IPDF's were awarded in 1986-87 to companies in Richmond, Sidney, Okanagan Falls, Burnaby and Vancouver. An IPDF can be renewed once. There were three renewals in the past year. They went to firms in Vancouver, Sidney and Richmond.

Training Employment for Science and Technology

The federal and provincial governments established the TEST program in 1986-87, and asked the Science Council, through the Research Secretariat, to administer it. The program's objec-

tives are to assist recent post-secondary graduates to find meaningful work experience in the areas of science, technology and engineering; to provide industry with the resources to pursue science and technology-related initiatives with economic potential; and to create permanent jobs. A total of $500,000 was provided for the fiscal year ending March 31, 1987. The program became active shortly before that.

The 1986 British Columbia Science and Engineering Awards

The winners of this year's British Columbia Science and Engineering Awards illustrate the range and depth of achievement among this province's leading researchers and innovators.

Dan Gelbart

Mr. Dan Gelbart's innovations have resulted in the development of the world's largest selling mobile computer terminal and the most sophisticated range of digital film recorders available anywhere. He is now a partner in Creo Electronics of Burnaby, where he and his associates are developing a digital film data storage system, assisted in part by an AGAR grant.

Mike Thewalt and George Kirczenow

While they worked at the University of British Columbia, Drs. George Kirczenow and Michael Thewalt made discoveries that provided significant new data concerning the behavior of semi-conductors. Both are now in the Department of Physics at Simon Fraser University.

Vinod Modi

Dr. Vinod Modi, of the Department of Mechanical Engineering at the University of British Columbia, has made major contributions to fields as diverse as aerospace, alternative energy sources, the so-called "three body problem" of planetary motion, and biomechanics.

Each winner received a gold medal and a handsome plaque at the annual British Columbia Science and Engineering Awards Dinner held in the Hotel Vancouver in October. Dr. Fraser Mustard, president of the Canadian Institute for Advanced Research, was the guest speaker.

Special Awards and Grants

During the course of the year, the Science Council receives a variety of requests for special grants. Normally, these are evaluated on the basis of scientific merit and their potential for in-

creasing awareness and appreciation of the role of science in the province.

In 1986-87, the Council received twelve such requests. It extended its commitment of $60,000 to help pay the salary of the Director of the Arts, Sciences and Technology Centre in Vancouver, reaffirming its desire to see a world-class science centre created in British Columbia. In addition, $21,000 was made available to the Centre for its coordination and development of regional science fairs throughout the province, in association with the Youth Sciences Foundation.

The Council sponsored the attendance of two British Columbia high school students in the "Shad Valley Program", put on at the University of British Columbia by the Canadian Centre for Creative Technology.

And, once again, the Science Council awarded the prize of a book to the graduating student, at every participating high school in the province, who achieved the highest marks in science. This program is administered for the Science Council by the British Columbia Science Teachers' Association.

Advice to Government

A key part of the Science Council's mandate, established by the provincial legislature in the Science Council Act, is to provide advice to the government on matters concerning science and technology in British Columbia. The Science Council was asked to review a proposal by industry and the universities to establish a microelectronics centre and support program in the Vancouver area.

A similar request from the government prompted the Council to look into a proposal to establish an organization to coordinate and stimulate biotechnology research related to the forest industry.

Public Awareness and Information Services

To help publicize the remarkable results of the study undertaken by Dr. Craig Walden, the Science Council commissioned the production of a 20-minute video documentary entitled "Payback: The Rewards of Good Science". Written and directed by Vancouver film-maker Keith Cutler, "Payback" provides capsule glimpses of a number of projects assisted by Council AGAR grants in recent years, illustrating in each case what the economic payback to the province has been. Copies of the tape have been distributed to universities, professional organizations, research groups, television stations, public libraries and schools, and to others who have requested it.

The Year in Review *cont.....*

A general brochure on the Science Council and one specific to the AGAR program were published and distributed in 1986-87. The Science Council has set up a small portable exhibit system at conventions, business meetings, and at the Discovery Parks, University of Victoria and University of British Columbia open houses.

The chairman and other members of the Science Council and Research Secretariat staff were invited to give talks to a number of interested groups and organizations throughout the year.

Members of the Science Council

The Science Council has fifteen members. During 1986 Mr. Ray Williams retired, following a two-and-a-half term, and Dr. James McEwen, a specialist in biomedical engineering, was appointed to a two year term, effective September, 1986.

The Secretariat on Science Research and Development

Science Council members are volunteers. So are the members of the subcommittees that review applications for the various grants, scholarships and fellowships and nominations for the awards. Ongoing administration of these programs is provided by Dr. Jack Sample, Executive Director, Dr. Max Cairns, Associate Director, and their staff at the Secretariat.

With a full-time staff of nine, the Secretariat provides services to the Science Council of British Columbia, the British Columbia Health Care Research Foundation and the federal-provincial T.E.S.T. program. It advises and distributes information to potential applicants, processes applications and monitors the progress of each researcher, student and trainee.

The Secretariat organizes the Council's regular meetings and those of the various standing committees and subcommittees. It maintains close contact and exchanges information with other organizations across the country and throughout the world that have a specific interest in developing scientific and technological resources for economic gain.

In addition to his Secretariat work, the Executive Director, Dr. Sample, maintains an active program of fundamental research at TRIUMF. He is also on the board of the Terry Fox Medical Research Foundation. Dr. Max Cairns, Associate Director, is a member of the University of British Columbia's Cooperative Education Employers' Council.

Science Council of B.C.
Schedule of Assistance Grants for Applied Research (A.G.A.R.) Commitments for the year ended March 31, 1987

1. **Research Grant Competition #14 (RC-14)**

GRANT RECIPIENT & ORGANIZATION	PROJECT DESCRIPTION	TOTAL $ COMMITTED 1986-87
A. AGRICULTURE & FOOD		
Mr. B. Macdonald (UBC, Botanical Garden)	Plant Introduction Scheme of the Botanical Garden (P.I.S.B.G.).	50,000
Dr. B. Owen (UBC, Animal Science)	Cellulosic pulp mill wastes in beef cattle finishing rations.	36,000
Dr. K.L. Pinder (UBC, Chemical Engineering)	Development of a separated-phase anaerobic fermentation process for industrial wastes from food processing.	43,930
Drs. R. Zapf-Gilje & B. Rabinowitz (Novatec Consultants Ltd., Vancouver)	Establishing design criteria for secondary effluent nutrient removal using snowmaking techniques.	9,600
B. AQUATIC RESOURCES		
Dr. H. Ching (Hydra Enterprises Ltd., Vancouver)	Improvement of potential salmonid fish productivity by the use of disease resistant stocks.	20,344
Dr. R.M. Clements (UVIC, Physics)	Continued development of a new underwater acoustic source.	45,450
Dr. R. Ring (UVIC, Biology)	Biocontrol of Eurasian water milfoil.	30,144
C. COMPUTERS & COMPUTING		
Dr. S.J. Eady (Centre for Speech Technology Research, Victoria)	An automated system for computer generated speech output.	35,000
Mr. C. Graham (Harmony Research Ltd., Vancouver)	Instrument Data Acquisition/Analysis using Ashton-Tate Framework.	40,000

1. **Research Grant Competition #14 (RC-14)** *cont.....*

GRANT RECIPIENT & ORGANIZATION	PROJECT DESCRIPTION	TOTAL & COMMITTED 1986-87
C. COMPUTERS & COMPUTING *cont.....*		
Mr. G.M. Josin (Neural Systems Inc., Vancouver)	Application of a "Neural Network Theory " to a specific problem - a software program for an intelligent data communications-encoder-decoder.	34,000
D. ELECTRONICS & COMMUNICATIONS		
Dr. M. Burbank (CTF Systems Inc., Port Coquitlam) and Drs. B. Heinrich & R.F. Frindt (SFU, Physics)	Characterization of thin film Josephson Junctions/Developments of a commercial planar SQUID magnetic field sensor.	114,320
Mr. W. Cameron (Neil Squire Foundation, Vancouver)	Smart modular environmental controller.	53,000
Mr. S. Jarvin & Mr. J. Mattock (Seastar Instruments Ltd., Sidney)	Development of an Acoustic Command Transceiver.	58,007
Dr. A. Leung (SFU, School of Engineering Science)	Development of the QUICK CHIP- a one-day turnaround, microchip fabrication resource.	150,780
E. ENERGY		
No projects funded		
F. FOREST & FOREST PRODUCTS		
Dr. R.B. Blackwell (Sandwell and Co. Ltd., Vancouver)	Improved gas mixing in kraft recovery boilers-physical modelling.	87,375
Mr. T. Bonac & Dr. J. Brdicko (Cetec Engineering Co., Burnaby)	Development of circular saw analyzer.	20,000
Dr. J.H. Borden (SFU, Biological Sciences)	Integrated management of bark beetles.	41,502

1. **Research Grant Competition #14 (RC-14)** *cont.....*

GRANT RECIPIENT & ORGANIZATION	PROJECT DESCRIPTION	TOTAL $ COMMITTED 1986-87
F. FOREST & FOREST PRODUCTS *cont.....*		
Drs. P.G. Comeau & J.P. Kimmins (UBC, Forestry)	Development of a microcomputer simulation model for the prediction of lodgepole pine spacing responses.	5,000
Mr. J.M. Ewart (F.E.R.I.C., Vancouver)	Length optimizer for a mechanical stroke delimber.	30,000
Dr. L.R. Galloway (UBC, Chemical Engineering)	The removal of plastic contaminants from virgin kraft pulp.	29,370
Mr. J.T. Peterson (F.E.R.I.C., Vancouver)	Roadside processing (limbing and bucking of logs).	115,000
Dr. D.R. Seip (UBC, Forestry)	Development of logging recommendations to protect caribou populations in central B.C.	29,800
Mr. A. Sinclair (F.E.R.I.C., Vancouver)	High pressure, underfired pit burning of logyard waste.	33,500
Dr. I.E.P. Taylor (UBC, Botany)	Micropropagation of embryonic and mature lodgepole pine.	64,620
Dr. J.K. Turnbull (MacMillan Bloedel Research, Vancouver)	Improved control of peroxide brightening of mechanical pulp.	78,249
Mr. D.C. Walser & Ms. S.R. Warren (Forintek Canada Corp., Vancouver)	Improving the performance of cutting knives in the forest products industry.	21,822
Dr. G.F. Weetman (UBC, Forest Sciences)	Stand density diagrams and nutrition of western red cedar and sitka spruce in British Columbia.	39,540

1. **Research Grant Competition #14 (RC-14)** *cont.....*

GRANT RECIPIENT & ORGANIZATION	PROJECT DESCRIPTION	TOTAL $ COMMITTED 1986-87
G. MANUFACTURING & MACHINERY		
Mr. A.J. Lees (Dynamic Signal Analysis Corporation, Burnaby)	Machinery vibration diagnostic system.	58,000
Mr. L.N. Scotten & Dr. D.K. Walker (Vivitro Systems Inc., Victoria)	Development of a durability tester for replacement heart valves.	30,720
H. MINING, MINERALS & METALS		
Dr. W.K. Fletcher (UBC, Geological Sciences)	Gold: Its forms and distribution in soils in the vicinity of gold mineralization.	34,353
Dr. C.I. Godwin (UBC, Geological Sciences)	Application of Galena Lead isotopes to decisions in mineral exploration and to metallogency in British Columbia.	27,050
Dr. H.V. Warren (UBC, Geological Sciences)	Thallium and selenium geochemistry; an improved approach to exploration for epithermal gold deposits in British Columbia.	14,750
I. TRANSPORTATION		
No projects funded.		
	(RC-14) TOTAL $ COMMITTED 1986-87 (33 PROJECTS)	1,481,226

2. **Research Grant Competition #15 (RC-15)**

GRANT RECIPIENT & ORGANIZATION	PROJECT DESCRIPTION	TOTAL $ COMMITTED 1986-87
A. AGRICULTURE & FOOD		
Dr. R. Blair (UBC, Animal Science)	Improved vitamin allowances for weanling swine.	20,000
Dr. L. Gilkeson (Applied Bio-Nomics Ltd., Sidney)	Application of the Predator, Aphidoletes aphidimyza, to control aphids in greenhouses and orchards.	32,000
Dr. S. Nakai (UBC, Food Science)	Complete utilization of animal blood wastes for food and pharmaceutical use by a new, mild process for separating blood protein.	51,018
Drs. W. Powrie & M. Tung (UBC, Food Science)	Fruit Gel Product Development.	41,460
B. AQUATIC RESOURCES		
Dr. A. Austin (UVIC, Biology)	Production of aquatic biofilm biomass and protein for use in aquaculture feedstocks.	26,000
Mr. R. Drew (Canadian Fishing Co., Vancouver) and Mr. J.R. Green (Neptune Dynamics Ltd., Vancouver)	Development of a new salmon head cutting technology as a means to improve utilization of the salmon resource through increased canned salmon case yields.	50,000
Dr. S. Lindstrom (Nori Aquafood Systems Inc., Richmond)	Nori fingerprinting: Establishing measures of quality in Nori aquaculture.	47,000
Drs. J.L. Littlepage and M. Leong (UVIC, Biology)	The development of a rapid immunoassay for the detection of IHN virus in Pacific salmonids.	20,978
Dr. R Peterson (UBC, Animal Science)	Brood stock development of Coho Salmon for commercial use in British Columbia aquaculture.	12,000
Mr. J. Richards (Nanaimo)	Development and evaluation of a practical diet for farmed sablefish from fish silage.	27,950

2. **Research Grant Competition #15 (RC-15)** *cont.....*

GRANT RECIPIENT & ORGANIZATION	PROJECT DESCRIPTION	TOTAL $ COMMITTED 1986-87
B. AQUATIC RESOURCES *cont.....*		
Drs. P.M. Townsley and D.D. Kitts (UBC, Food Science)	Isolation and characterization of proteins induced by paralytic shellfish poisons.	30,000
Drs. T. Trust and D.W. Kay (Microtek Research and Development, Sidney)	High density vibriosis vaccines for aquaculture.	54,000
C. COMPUTERS & COMPUTING		
Mr. C. Dewhurst (Capilano Computing Systems Ltd., Vancouver)	Automated generation of circuit patterns for field programmable logic array integrated circuits.	50,000
Dr. R. Donaldson (UBC, Electrical Eng.)	Modem for local area networking on intra-building power lines.	40,000
Dr. R. Hobson (SFU, School of Computing Science)	Very large scale integration computer design.	75,000
Dr. P. Leimbigler (Int'l. Geosystems Corp., Vancouver)	Japanese text generators and word processors using the Tianma algorithms.	50,000
Mr. J. Roberts (Softek Services Ltd., Vancouver)	Development of advanced microcomputer software to utilize recently introduced memory expansion boards for solving large engineering structural analysis problems.	19,000
D. ELECTRONICS & COMMUNICATIONS		
Dr. A. Rawicz (SFU, School of Engineering Science)	Thermal and reliability network analysis system for electronic components, printed circuit boards, hybrids and integrated circuits.	88,700

2. **Research Grant Competition #15 (RC-15)** *cont.....*

GRANT RECIPIENT & ORGANIZATION	PROJECT DESCRIPTION	TOTAL $ COMMITTED 1986-87
D. ELECTRONIC & COMMUNICATIONS *cont.....*		
Dr. J. Fikart (Microtel Pacific Research, Burnaby)	Gallium Arsenide Microwave Integrated Circuit Modules.	85,510
E. ENERGY		
Dr. R.L. Evans (UBC, Mechanical Eng.)	Turbulent flame propagation in alternative fuels.	25,960
Mr. J. Taylor & Dr. B. Keefer (Highquest Eng. Inc., Vancouver)	Industrial oxygen generation using process waste heat.	70,000
Dr. P. Watkinson (UBC, Chemical Eng.)	Drying of hog fuel.	7,500
F. FOREST & FOREST PRODUCTS		
Dr. F. Bunnell (UBC, Forestry)	Managing forest stands to supply wildlife needs.	34,124
Mr. M.L. Clark (F.E.R.I.C., Vancouver)	Tractive evaluation for highway logging trucks.	36,815
Dr. M.C. Feller (UBC, Forestry)	The effects of prescribed burning on the nitrogen fertility of coastal forest soils.	47,426
Dr. S. Lindgren (Phero Tech Inc., Vancouver)	New methods for manipulating populations of bark beetles with semiochemicals.	47,505
Mr. R. Menes (Interact Research and Development, Victoria)	An analysis of air tanker efficiency for wildfire suppression in British Columbia.	40,160
Dr. J.N. Owens (UVIC, Biology)	Increased cone and seed production in western hemlock seed orchards.	27,992
Dr. W.E. Vidaver (SFU, Biological Sciences)	Physiological quality and performance evaluation of tree nursery planting stock.	26,400

2. **Research Grant Competition #15 (RC-15)** *cont.....*

GRANT RECIPIENT & ORGANIZATION	PROJECT DESCRIPTION	TOTAL $ COMMITTED 1986-87
G. MANUFACTURING & MACHINERY		
Mr. C. Anderson (Insul-Mastic and Building Products, New Westminster)	Development of a coating for protection of asphaltic roof membranes.	11,000
Drs. J. McEwen and W. Godolphin (Andronic Devices Ltd., Vancouver)	A robotic processor for hazardous blood specimens.	70,238
Dr. C. Winter (Quantum Technology Corp., Surrey)	Development of a medium sized helium liquifier.	45,000
H. MINING, MINERALS & METALS		
Mr. D. Albon (Clayburn Industries Ltd., Abbotsford)	To develop a refractory formulation suitable for lining the furnaces used to kiln bake carbon anodes for aluminum smelter services.	86,156
Dr. M. Bell (Uvic, Biology)	Reclaiming coal mined lands in the Rocky Mountains with native nitrogen-fixing plants.	7,000
Drs. G. Richards and J.K. Brimacombe (UBC, Centre for Metallurgical Process Engineering)	An industrial investigation of improvements in slag reduction processes.	35,760
	(RC-15) TOTAL $ COMMITTED 1986-87 (35 PROJECTS)	1,439,652

G.R.E.A.T. Scholarships Awarded 1986-87

1. NEW AWARDS (Competition GC-7)

NAME Of STUDENT	UNIVERSITY & DEPARTMENT(S)	NAME(S) OF ACADEMIC SUPERVISOR(S)	NAME(S) OF COOPERATING ORGANIZATION(S)
D.J. Bates	SFU, Biological Sciences	B.A. McKeown	Tidal Rush Marine Farms Ltd., Vancouver
A. Boudreau	UBC, Metallurgical Eng.	D. Tromans	MacMillan Bloedel Research, Vancouver
M. Breault	UBC, Electrical Eng.	M. Salcudean & D. Romilly	Vancouver General Hospital, Vancouver
J.E. Brooks	SFU, Biological Sciences	J.H. Borden	1) B.C. Forest Service, Victoria 2) Phero Tech Inc., Vancouver
J. Brown	SFU, Biological Sciences	M. Smith & A. Beckenbach	1) Ministry of Environment, Surrey 2) Seastar Resource Corp. Ltd., Vancouver
S. Dew	UBC, Physics	R.R. Parsons	Corona Vacuum Coaters Inc., Richmond
A. Gallagher	UBC, Physics	B. Turrell	Corona Vacuum Coaters Inc., Richmond
S. Gamiet	UBC, Soil Science	S.M. Berch	British Columbia Fruit Growers Association, Kelowna
M. Gardiner	SFU, Biological Sciences	B.D. Roitberg	Agriculture Canada Research Centre, Summerland
A.J. Gibb	UBC, Civil Engineering	W.K. Oldham	Dayton & Knight Ltd., West Vancouver
B. Girard	UBC, Food Science	S. Nakai	Fisheries Council of B.C., Vancouver

G.R.E.A.T. Scholarships Awarded 1986-87

1. NEW AWARDS *cont.....*

NAME OF STUDENT	UNIVERSITY & DEPARTMENT	NAME(S) OF ACADEMIC SUPERVISOR(S)	NAME(S) OF COOPERATING ORGANIZATION(S)
F. Juanes	SFU. Biological Sciences	A. Beckenbach	1) United Fishermen's & Allied Workers Union. Vancouver 2) Pacific Biological Station. DFO. Nanaimo
S. McCrae	SFU. Biological Sciences	L.J. Albright	1) Aquarium Seafarms Ltd., Sechelt 2) Hardy Sea Farms Inc., Vancouver 3) Pacific Aqua Foods Ltd., Vancouver 4) Royal Pacific Sea Farms Ltd., Vancouver 5) Seastar Resource Corp., Vancouver 6) Pacific Biological Station. DFO. Nanaimo
T. Miyamoto	UVIC. Linguistics	H.J. Warkentyne	Pacific Educational Systems Corporation. Victoria
L. Niki	SFU. Biological Sciences	L.J. Albright	1) Aquarium Seafarms Ltd., Sechelt 2) Hardy Sea Farms Inc., Vancouver 3) Pacific Aqua Foods Ltd., Vancouver 4) Royal Pacific Sea Farms Ltd., Vancouver 5) Seastar Resource Corp., Vancouver 6) Pacific Biological Station. DFO. Nanaimo

G.R.E.A.T. Scholarships Awarded 1986-87

1. NEW AWARDS *cont.....*

NAME OF STUDENT	UNIVERSITY & DEPARTMENT(S)	NAME(S) OF ACADEMIC SUPERVISOR(S)	NAME(S) OF COOPERATING ORGANIZATION(S)
D. Parker	UVIC, Biology	N.M. Sherwood	Tidal Rush Marine Farms Ltd., Vancouver
A.J. Stock	SFU, Biological Sciences	J.H. Borden	1) B.C. Forest Service, Smithers 2) Phero Tech Inc., Vancouver
C. Third	UBC, Metals & Materials Eng.	F. Weinberg	Cominco Ltd., Trail
P. Thompson	UBC, Botany & Oceanography	P.J. Harrison	Aqua Foods Ltd., Vancouver
S.C. Urbanczyk	UVIC, Linguistics	H.J. Warkentyne	Centre for Speech Technology Research, Victoria

2. RENEWAL AWARDS (Year 2)

H.J. Ashton	UBC, Animal Science	B. March	Sea Spring Salmon Farm Ltd., Chemainus
S.M. Banerjee	UBC, Botany	J. Maze	CIP Inc., Saanichton
J. Been	UBC, Chemical Eng.	C. Oloman	B.C. Research, Vancouver
W.V. Chicha	UBC, Chemistry	F. Aubke	Moli Energy Ltd., Burnaby
M. Dawkins	UVIC, Biology	J.N. Owens	Northwood Pulp & Timber Ltd., Prince George
M. Decamillis	UBC, Zoology	H.W. Brock	Quadra Logic Technologies Inc., Vancouver
D. Fayegh	UBC, Civil Eng.	S.O. Russell	Kerr, Wood Leidal Associates Ltd., North Vancouver
R. Fong	SFU, Chemistry	C. Jones	Moli Energy Limited, Burnaby

G.R.E.A.T. Scholarships Awarded 1986-87

2. RENEWAL AWARDS *cont.....*

NAME OF STUDENT	UNIVERSITY & DEPARTMENT(S)	NAME(S) OF ACADEMIC SUPERVISOR(S)	NAME(S) OF COOPERATING ORGANIZATION(S)
P.E. Kinahan	UBC. Physics	R.R. Johnson	TRIUMF. Vancouver
M. Kurtz	SFU. Biological Sciences	W. Vidaver	Agrogen Biotechnologies Inc.. Vancouver
M. Lord	UBC. Electrical Eng.	L. Young	Microtel Pacific Research Ltd.. Burnaby
N.R. McDougall	UBC. Animal Science	R.M. Beames	East Chilliwack Agricultural Cooperative. Chilliwack
J.M. Nelson	SFU. Biological Sciences	B.D. Roitberg	1) B.C. Ministry of Agriculture & Fisheries. Cloverdale 2) Agriculture Canada. Sidney
M.S. Perchanok	UBC. Mechanical Eng.	I.S. Gartshore	H.A. Simons (Int'l) Ltd.. Vancouver
D.L. Siu-Kau	UBC. Civil Eng.	S.F. Stiemer	Canron Western Bridge Division. Vancouver
P.J. Sullivan	SFU. School of Kinesiology	I.B. Mekjavic	Fitz-Wright Group of Companies. Surrey
J. Taylor	UBC. Mechanical Eng.	S.G. Hutton	Forintek Canada Corp.. Vancouver

3. RENEWAL AWARDS (Year 3)

K. Lertzman	UBC. Forest Science	J.P. Kimmins	MacMillan Bloedel Ltd.. Nanaimo
I.P. Street	UBC. Chemistry	S.G. Withers	Forintek Canada Corp..

Industrial Post Doctoral Fellowships Awarded 1986 - 1987

1. NEW AWARDS

AWARD RECIPIENT	DISCIPLINE & YEAR OF GRADUATION	EMPLOYING COMPANY
N. Fortier	Physics, 1986	Corona Vacuum Coaters Inc., Richmond
R.D. Huston	Underwater Acoustics, 1987	Arctic Sciences Ltd., Sidney
C.L. Lee	Chemistry, 1981	Pyrotite Coatings of Canada Inc., Vancouver
H. Ramaswamy	Food Science, 1984	Okanagan Dried Fruits Ltd., Okanagan Falls
B.J. Sharpe	Mathematics, 1984	MacDonald Dettwiler & Associates Ltd., Richmond
U. von Sacken	Physics, 1985	Moli Energy Ltd., Burnaby
J.B. Wallace	Chemical/Biochemical Engineering, 1987	B.C. Research, Vancouver

2. RENEWAL AWARDS

B. Rabinowitz	Civil Engineering, 1985	Novatec Consultants Inc., Vancouver
S.R. Severn	Microbiology/Toxicology, 1985	C.B. Research International Corp., Sidney
R. Vefghi	Inorganic Chemistry, 1982	Industrial Science Laboratory Inc., Richmond

FINANCIAL STATEMENTS

AUDITORS' REPORT

TO THE MINISTER OF

ADVANCED EDUCATION AND JOB TRAINING

We have examined the balance sheet of The Science Council of British Columbia and Secretariat on Science, Research and Development as at March 31, 1987 and the statements of research appropriations, expenditures and unexpended appropriations; operations appropriations, expenditures and unexpended appropriations; and T.E.S.T. appropriations, expenditures and unexpended appropriations for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as we considered necessary in the circumstances.

In our opinion, these financial statements present fairly the financial position of the Council and Secretariat as at March 31, 1987 and the results of their operations for the year then ended in accordance with generally accepted accounting principles, as modified by note 1 to the financial statements, applied on a basis consistent with that of the preceding year.

Coopers & Lybrand

Vancouver, B.C.

May 26, 1987

THE SCIENCE COUNCIL OF BRITISH COLUMBIA AND SECRETARIAT ON SCIENCE, RESEARCH AND DEVELOPMENT

STATEMENT OF RESEARCH APPROPRIATIONS, EXPENDITURES AND UNEXPENDED APPROPRIATIONS

FOR THE YEAR ENDED MARCH 31, 1987

	1987 $	1986 $
RESEARCH APPROPRIATIONS		
Grants from the Province of British Columbia	3,500.000	3,500,003
Interest	225,010	300,554
Refunds of prior years' research expenditures	82,036	118,720
other	454	7,295
	3,807,500	3,926,572
RESEARCH EXPENDITURES - see Schedule		
Research grants	2,838,723	3,389,748
Industrial Post-Doctoral Fellowships (IPDF)	228,125	187,500
Graduate Research Engineering and Technology (GREAT) awards	507,000	624,000
Science and Engineering awards	19,799	26,311
Special requests	90,215	76,798
Special projects	86,447	93,529
Honoraria and other expenses	8,950	9,525
	3,779,259	4,407,411
EXCESS (DEFICIENCY) OF APPROPRIATIONS OVER EXPENDITURES FOR THE YEAR	28,241	(480,839)
UNEXPENDED APPROPRIATIONS - BEGINNING OF YEAR	2,574,820	3,055,659
UNEXPENDED APPROPRIATIONS - END OF YEAR (encumbered by outstanding commitments) (note 2)	2,603,061	2,574,820

THE SCIENCE COUNCIL OF BRITISH COLUMBIA
AND SECRETARIAT ON SCIENCE, RESEARCH AND DEVELOPMENT
STATEMENT OF T.E.S.T. APPROPRIATIONS, EXPENDITURES
AND UNEXPENDED APPROPRIATIONS
FOR THE PERIOD ENDED MARCH 31, 1987 (note 3)

	Period from December 1, 1986 to March 31, 1987 $
T.E.S.T. APPROPRIATIONS	
Grants from the Province of British Columbia	250,000
Grants from the Government of Canada	15,052
Interest income	2,083
	267,135
T.E.S.T. EXPENDITURES	
Administration and accounting	6,496
Courier, communications and travel	495
Rent	813
Salaries and employee benefits	4,855
Utilities and supplies	2,393
	15,052
EXCESS OF APPROPRIATIONS OVER EXPENDITURES FOR THE PERIOD	252,083
UNEXPENDED APPROPRIATIONS - BEGINNING OF PERIOD	Nil
UNEXPENDED APPROPRIATIONS - END OF PERIOD (encumbered by outstanding commitments) (note 3)	252,083

THE SCIENCE COUNCIL OF BRITISH COLUMBIA
AND SECRETARIAT ON SCIENCE, RESEARCH AND DEVELOPMENT
STATEMENT OF OPERATIONS APPROPRIATIONS, EXPENDITURES AND UNEXPENDED APPROPRIATIONS
FOR THE YEAR ENDED MARCH 31, 1987

	1987 $	1986 $
OPERATIONS APPROPRIATIONS		
Grants from the Province of British Columbia	300,000	300,000
Interest	12,163	10,709
	312,163	310,709
EXPENDITURES		
Computer services	5,748	6,004
Consulting and temporary staff	4,466	2,859
Furniture and equipment	11,430	5,422
Leasehold improvements	49,538	
Long-term planning study	40,000	
Meetings	4,593	3,365
Photocopying and printing	20,050	22,813
Postage and courier	7,722	7,679
Professional fees	5,580	4,958
Publications	2,434	1,922
Rent	38,240	30,180
Salaries and employee benefits	267,396	249,525
Stationery and supplies	4,597	2,762
Telephone	11,523	10,089
Travel	9,914	11,735
	483,231	359,313
RECOVERY OF EXPENDITURES		
British Columbia Health Care Research Foundation	112,843	111,916
Other	134	361
Training Employment in Science and Technology	15,052	
	128,029	112,277
EXCESS (DEFICIENCY) OF APPROPRIATIONS OVER EXPENDITURES FOR THE YEAR	(43,039)	63,673
UNEXPENDED APPROPRIATIONS - BEGINNING OF YEAR	112,611	48,938
UNEXPENDED APPROPRIATIONS - END OF YEAR	69,572	112,611

THE SCIENCE COUNCIL OF BRITISH COLUMBIA
AND SECRETARIAT ON SCIENCE, RESEARCH AND DEVELOPMENT
BALANCE SHEET AS AT MARCH 31, 1987

ASSETS

	1987 $	1986 $
CASH AND SHORT-TERM DEPOSITS	2,985,688	2,687,194
ACCOUNTS RECEIVABLE	33,435	43,589
PREPAID EXPENSES	1,611	1,611
	3,020,734	2,732,394

LIABILITIES

ACCOUNTS PAYABLE AND ACCRUED LIABILITIES	96,018	44,963

UNEXPENDED APPROPRIATIONS

RESEARCH (note 2)	2,603,061	2,574,820
TRAINING EMPLOYMENT IN SCIENCE AND TECHNOLOGY (note 3)	252,083	
OPERATIONS	69,572	112,611
	2,924,716	2,687,431

COMMITMENTS (Schedule and notes 2 and 3)

APPROVED BY THE COUNCIL AND SECRETARIAT

THE SCIENCE COUNCIL OF BRITISH COLUMBIA
AND SECRETARIAT ON SCIENCE, RESEARCH AND DEVELOPMENT
NOTES TO FINANCIAL STATEMENTS
FOR THE YEAR ENDED MARCH 31, 1987

1. ACCOUNTING POLICIES

Fixed Assets

Fixed assets are not capitalized and depreciated as assets of the Council and Secretariat, but are written off in the period in which they are purchased.

2. RESEARCH GRANT COMMITMENTS (see Schedule)

During the year, the Council approved funding for research projects, IPDF's, GREAT's, Science and Engineering awards, special requests, special projects, honoraria and other expenses totalling $3,874,916. At March 31, 1987, known outstanding commitments totalled $2,523,172 which, together with additional estimated renewed commitments for the year ending March 31, 1988 of $1,588,083, amount to $4,111,255 in known and estimated outstanding commitments.

3. TRAINING EMPLOYMENT IN SCIENCE AND TECHNOLOGY

The program is a joint federally and provincially funded incentive program whereby financial assistance is available to firms and corporations which hire post-secondary graduates in the fields of science, engineering and technology.

Administration costs for the program are paid by the Secretariat and are later reimbursed by the governments. Funding from the provincial government for administration and programs has been received. The federal government funds administration costs but disburses funds directly to the grantees. At March 31, 1987, known commitments totalled $236,953 for provincial grants and $11,220 for federal grants. The program is to be funded until March 31, 1988, when a review by the two governments will determine if funding should continue.

THE SCIENCE COUNCIL OF BRITISH COLUMBIA
AND SECRETARIAT ON SCIENCE, RESEARCH AND DEVELOPMENT
SCHEDULE OF COMMITMENTS AND DISBURSEMENTS OF SCIENCE COUNCIL RESEARCH GRANTS
FOR THE YEAR ENDED MARCH 31, 1987

	Known outstanding commitments-beginning of year $	Additional commitments during year $	Commitment reductions during year $	Disbursed during year $	Known outstanding commitments-end of year $	Estimated renewed commitments 1987 - 1988 $	Known and estimated outstanding commitments at March 31, 1987 $
RESEARCH GRANTS							
Research Competition #5	18,482			18,482			
Research Competition #6	7,970				7,970		7,970
Research Competition #7	11,623			2,283	9,340		9,340
Research Competition #8	7,026			3,916			
Research Competition #9	57,442		(3,110)	18,940	27,990		27,990
Research Competition #10	85,702		(10,512)	83,162	982		982
Research Competition #11	250,087		(1,558)	172,250	33,740		33,740
Research Competition #12	696,876		(44,097)	391,088	205,788		205,788
Research Competition #13	1,136,524	1,492		776,997	361,019		361,019
Research Competition #14		1,481,226	(1,865)	838,195	641,166	656,368	1,297,534
Research Competition #15		1,439,652		432,410	1,006,242	557,715	1,563,957
	2,271,732	2,922,370	(61,142)	2,838,723	2,294,237	1,214,083	3,508,320
IPDFs	137,500	250,000	(16,655)	228,125	142,720	75,000	217,720
GREATs		507,000		507,000		299,000	299,000
SCIENCE AND ENGINEERING AWARDS		19,799		19,799			
SPECIAL REQUESTS							
Arts Science and Technology Centre - Director	60,000	30,000		45,000	45,000		45,000
Arts Science and Technology Centre - Regional Science Fairs 1986	1,400			1,400			
Arts Science and Technology Centre - Regional Science Fairs 1987		2,000		18,900	2,100		2,100
B C Research - Artificial Light	9,045			5,310	3,735		3,735
B C S T A F I S A Book Prize 1986	13,500		(8,005)	5,495			5,230
B C S T A F I S A Book Prize 1987		10,000		4,770	5,230		
Canadian Centre for Creative Technology - Student Sponsorship		6,200		6,200			
S T C Enterprises - Forest Technology Study		5,150			5,150		5,150
H R MacMillan Planetarium	1,300			1,300			
H R MacMillan Planetarium - Halley's Comet	1,840			1,840			
Supercomputer Study		10,000			10,000		10,000
Superconductor Workshop		5,000			5,000		5,000
T V Science Snow '87 (Pearl Productions)		10,000			10,000		10,000
	87,085	97,350	(8,005)	90,215	86,215		86,215
SPECIAL PROJECTS							
Public Information		69,447		69,447			
Public Information - Video Project	17,000			17,000			
	17,000	69,447		86,447			
HONORARIA AND OTHER EXPENSES		8,950		8,950			
	2,513,317	3,874,916	00(85,802)	3,779,259	2,523,172	1,588,083	4,111,255